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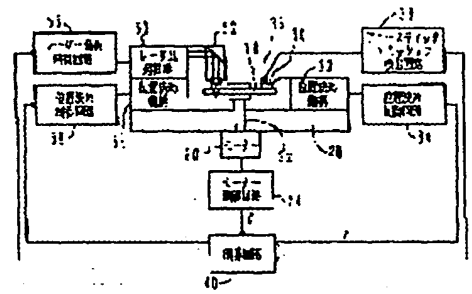
(54) MANUFACTURE OF RECORDING DISK, ITS MANUFACTURE DEVICE AND RECORDING DISK

(57)Abstract:
PROBLEM TO BE SOLVED: To remove fine projections formed on a surface at the time of manufacturing a recording disk.
SOLUTION: A piezoelectric element 36 fitted to a head for floating characteristic measurement 30 detects acoustic emission when the head for floating characteristic measurement 30 collides with a projection part formed on the surface of the magnetic disk 10 and it detects the position of the projecting part. The detected projecting part is irradiated with laser beams from a laser beam oscillator 50 and it is removed.



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CLAIMS

[Claim(s)]
[Claim 1] The manufacture approach of the record disk which detects the height formed in the front face of the above-mentioned record disk, and is characterized by irradiating a energy beam to the detected height and removing this height in the manufacture approach of a record disk that record film was formed on the substrate.
[Claim 2] The manufacturing installation of the record disk characterized by having a detection means to detect the height formed in the front face of the record disk with which record film was formed on the substrate, and a clearance means to irradiate a energy beam to the height detected by this detection means, and to remove this height.
[Claim 3] The record disk characterized by some above-mentioned record film being removed in the record disk with which record film was formed on the substrate by the energy beam irradiated by the front face.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of a record disk, its manufacturing installation, and a record disk, and relates to the low manufacture approach of a record disk, its manufacturing installation, and record disk of the flying height of the recording head to a disk like a magnetic disk especially.
[0002]
[Description of the Prior Art] Lowering of the flying height of the magnetic head in a magnetic disk drive in recent years is remarkable, and is beginning to be marketed to a 50nm thing by current. Moreover, also in the disk unit by the near-field optical recording called a tera store, the flying height of a recording head is low.
[0003] The height formed in a disk front face in the manufacture process of a record disk is becoming the failure of the reduction in floatation with the reduction in floatation of a recording head. Generally, it is trying hard to eliminate the possibility of mixing of the foreign matter which becomes the hindrance of the reduction in floatation by using a clean room etc. in the production process of a magnetic disk. However, during membrane formation of a magnetic film, minute dust may mix unescapable and a height is formed on the surface of a magnetic disk. Although an error will not occur in the phase of R/W inspection which writes in data after manufacture and is reproduced further if a magnetic film is formed on foreign matters, such as dust, while repeating R/W of data after that, in order that the magnetic head may collide with a height and may remove a surface magnetic film gradually, the already written-in data will be lost.
[0004] Then, in the final process of a magnetic disk, the polish tape was lightly contacted on the surface of the magnetic disk, and the approach of cleaning a surface foreign matter was used as conventionally indicated by JP,6-52568,B. Although recognized as an error field by R/W inspection by removing beforehand the foreign matter and the magnetic film of this front face, if the number of an error field is below the predetermined number per 1st page of disk, a problem will not become in respect of an error guarantee.
[0005]
[Problem(s) to be Solved by the Invention] When the flying height of the magnetic head was high, clearance of the projection formed on the magnetic disk also by the approach using the conventional polish tape was fully performed. However, when the flying height of the magnetic head became low in recent years, it became clear by the approach on the conventional polish tape that there was a projection which cannot be removed. As a floatation guarantee at the time of manufacture of a magnetic disk, it is required for a magnetic-disk front face for one piece not to have a projection with which the magnetic head collides, either. However, since there is a projection which cannot be removed when the flying height of the magnetic head becomes low, the yield at the time of manufacture of a magnetic disk will fall.
[0006] When this invention persons considered the projection formed on the surface of a magnetic disk,

height of a projection was high, and it became clear that a projection removable on a polish tape was what is depended on the dust adhering to a magnetic-disk front face etc. On the other hand, it became clear that the low projection of height was minute climax of the medium film by what is depended on minute climax of the magnetic-disk substrate itself, the minute foreign matter which entered between a magnetic-disk substrate and the medium film, for example, the detergent used at the washing process of a magnetic-disk substrate, etc. Although the approach to which a load load is made to increase was able to be considered when it was going to remove the projection to these minute climaxes using the conventional polish tape, by this approach, it will grind to other parts of the medium film.
[0007] In addition, also in the disk unit by near-field optical recording, although the above explanation is about a magnetic disk, since the flying height of a recording head is low, the same problem is generated.
[0008] The object of this invention is to offer the record disk manufactured based on the manufacture approach of the manufacturing installation used for the manufacture approach of a record disk that the minute projection formed in a front face at the time of manufacture of a record disk is removable, and the manufacture approach of this record disk, and this record disk.
[0009]
[Means for Solving the Problem]
(1) In order to attain the above-mentioned object, in the manufacture approach of a record disk that record film was formed on the substrate, this invention detects the height formed in the front face of the above-mentioned record disk, irradiates a energy beam to the detected height, and removes this height. By this approach, the minute projection formed in a front face at the time of manufacture of a record disk can be removed.
[0010] (2) This invention is equipped with a detection means to detect the height formed in the front face of the record disk with which record film was formed on the substrate, and a clearance means to irradiate a energy beam to the height detected by this detection means, and to remove this height in order to attain the above-mentioned object. This configuration can also remove easily the minute projection formed in a front face at the time of manufacture of a record disk.
[0011] (3) In order to attain the above-mentioned object, this invention is removed in the record disk with which record film was formed on the substrate by the energy beam by which some above-mentioned record film was irradiated by the front face. By this configuration, the minute projection formed in a front face at the time of manufacture of a record disk is also removed easily, and a record disk can be obtained with the sufficient yield.
[0012]
[Embodiment of the Invention] Hereafter, the manufacture approach of the magnetic disk by 1 operation gestalt of this invention, its manufacturing installation, and a magnetic disk are explained using drawing 1 - drawing 4 . First, drawing 1 is used and the whole magnetic-disk manufacturing installation configuration by 1 operation gestalt of this invention is explained.
[0013] The magnetic disk 10 is attached in the spindle 22 of a rotary motor 20, and rotates with a rotary motor 20. The rotational frequency of a rotary motor 20 is controlled by the motor control circuit 24. The motor control circuit 24 is equipped with the encoder, and an encoder outputs the angle-of-rotation information theta from a criteria location to an arithmetic circuit 40. The rotary motor 20 is being fixed to the base 26.
[0014] The magnetic film and protective coat whose magnetic disk 10 is the medium film beforehand through each process of texture processing, washing, substrate heating, chromium (Cr) substrate film formation, cobalt (Co) magnetic film formation, and (Carbon C) protective coat formation are formed.
[0015] With the negative pressure generated when a magnetic disk 10 rotates with a rotary motor 20, the head 30 for floatation property measurement has surfaced by the predetermined flying height in the front face of a magnetic disk 10. Like the magnetic head for the usual record playback, although the head 30 for floatation property measurement has the negative pressure slider, since record/playback of data are unnecessary, the magnetic transducer is not equipped with it. The head 30 for floatation property measurement positions radial [of a magnetic disk 10] according to the positioning device 32.

The positioning device 32 is constituted by the carriage which had the end supported by the same for example, usual revolution actuator like a voice coil motor as the positioning device in the magnetic head for record playback and this usual revolution actuator. Fixed maintenance of the head 30 for floatation property measurement is carried out at the other end of carriage. When the flying height of the magnetic head for the usual record playback is 50nm, the flying height of the head 30 for floatation property measurement is set up with the thing lower than this, for example, may be 30nm. When the flying height of the magnetic head for the usual record playback is 50nm, the flying height of the head 30 for floatation property measurement may be 25nm - 30nm. That is, the flying height of the head 30 for floatation property measurement is taken as 50% - 60% of height of the flying height of the magnetic head for the usual record playback.
[0016] The positioning device 32 is controlled by the positioning control circuit 34, and is controlling the radial location of the head 30 for floatation property measurement to a magnetic disk 10. The point-to-point-control circuit 34 outputs the radius positional information r which shows the radial location of the head 30 for floatation property measurement to a magnetic disk 10 to an arithmetic circuit 40.
[0017] The head 30 for floatation property measurement is equipped with the piezo-electric element 36 for acoustic emission detection. When rotating a magnetic disk 10 with a rotary motor 20, and a height with a height of 30nm or more is shown in the front face of a magnetic disk 10 and the head 30 for floatation property measurement collides with this height, an acoustic wave (acoustic emission) occurs. It connects with the acoustic emission detector 38, and a piezo-electric element 36 detects the acoustic wave generated when the head 30 for floatation property measurement collides with a height as an electrical signal, and outputs the acoustic emission detector 38 to an arithmetic circuit 40.
[0018] An arithmetic circuit 40 detects the location of the height of the front face of a magnetic disk 10 based on the angle-of-rotation information theta inputted from the radius positional information r inputted from the point-to-point control circuit 34, and the motor control circuit 24, when the height of the front face of a magnetic disk 10 is detected by the acoustic emission detector 38.
[0019] Here, the positional information of the height on a magnetic disk is explained using drawing 2 .
[0020] The height 100 is formed on the magnetic disk 10, and this height 100 is detected by the acoustic emission detector 38. On the other hand, the radial positional information r of the head 30 for floatation property measurement which has surfaced with the magnetic disk 10 is inputted from the point-to-point control circuit 34. Moreover, although the encoder which the motor control circuit 24 has consists of photo couplers arranged on both sides of two or more slits formed in the disc, and this slit and outputs a pulse signal according to a revolution of a rotary motor 20, an output of the signal of a criteria location is possible for it by approaches, such as making large width of face of one slit in two or more slits. Therefore, an arithmetic circuit 40 can acquire the angle-of-rotation information theta from a criteria location.
[0021] An arithmetic circuit 40 detects the location of the height 100 of the front face of a magnetic disk 10 based on the angle-of-rotation information theta inputted from the radius positional information r inputted from the point-to-point control circuit 34, and the motor control circuit 24, when the height 100 of the front face of a magnetic disk 10 is detected by the acoustic emission detector 38.
[0022] In addition, in two or more case, although the height 100 is made into one piece, it is detectable [height] similarly with the example shown in drawing 2 (A).
[0023] Furthermore, in drawing 1 , it has the laser light oscillator 50 in this operation gestalt. The laser light emitted from the laser light oscillator 50 is irradiated by the front face of a magnetic disk 10 using the optical system 52 for a laser beam exposure. In the front face of a magnetic disk 10, image formation of the laser light irradiated by the front face of a magnetic disk 10 may be carried out, and it may be irradiated by the front face of a magnetic disk 10 as a collimated beam. The beam diameter in the front face of a magnetic disk 10 is set to 1 micrometer. Moreover, the output of the laser oscillator 50 is set to 100W.
[0024] The positioning device 54 drives the optical system 52 for a laser beam exposure, and controls the radial location of the laser beam to a magnetic disk 10. The positioning device 54 consists of a device in which an objective lens is driven with a voice coil, like the optical pickup in an optical disk

unit.
[0025] On-off control of the laser light oscillator 50 is carried out by the laser oscillation control circuit 56 in the oscillation of a laser beam. Moreover, the point-to-point-control circuit 58 controls the radial location of the laser light irradiated by the front face of a magnetic disk 10 using the positioning device 54.
[0026] Next, clearance actuation of the height on the front face of a magnetic disk by the magnetic-disk manufacturing installation by this operation gestalt is explained. If the height of the front face of a magnetic disk 10 is detected by the acoustic emission detector 38, an arithmetic circuit 40 will detect the location of the height of the front face of a magnetic disk 10 based on the angle-of-rotation information theta inputted from the radius positional information r inputted from the point-to-point control circuit 34 when the height is detected, and the motor control circuit 24. An arithmetic circuit 40 outputs the radius positional information r to the positioning circuit 58. Based on the inputted radius positional information r, the positioning circuit 58 drives the optical system 52 for a laser beam exposure, and it controls it so that the radial location of a laser beam serves as a radius r to a magnetic disk 10.
[0027] When 180 degrees of locations of the angle-of-rotation direction of the laser beam irradiated by the optical system 52 for a laser beam exposure have shifted from the head 10 for floatation property measurement, moreover, an arithmetic circuit 40 Based on the angle-of-rotation information theta acquired from the motor control circuit 24, to the angle of rotation theta 1 when a height is detected to the timing from which angle of rotation became theta1+180 degree An ON command operates delivery and the laser oscillator 50 to the laser oscillation control circuit 56, and the spot exposure of the laser beam is carried out on the front face of a magnetic disk 10.
[0028] As shown in drawing 2 (B), of the spot exposure of laser light, the height of the front face of a magnetic disk 10 is removed, and the clearance marks 110 of a height are formed in the front face of a magnetic disk 10. the configuration as the cross-section configuration of a laser beam where the clearance marks 110 formed in the front face of a magnetic disk 10 by making into a short time time amount which turns on the laser oscillator 50 are the same -- for example, it becomes almost circular. If time amount which turns on the laser oscillator 50 is lengthened, in order to remove the medium film during the oscillation of the laser oscillator 50 to the normal field which the clearance marks 110 serve as an ellipse and does not have a height since the magnetic disk 10 is rotating with the rotary motor 20, irradiation time of laser is made into a short time.
[0029] Moreover, a height has not only when foreign matters, such as dust, adhere on the surface of a magnetic disk, but the minute projection produced by adhesion of a detergent etc. and the minute projection by climax of a magnetic-disk substrate. Since, as for these projections, the ease of carrying out of clearance differs, the exposure of laser light is divided into multiple times, and it is made to perform it. That is, when the height was detected, it checks whether a height is detected again in the same location and a height is again detected after irradiating laser light once, as laser light is irradiated again in the same location, laser light is irradiated until it repeats detection of a height, and the exposure of laser light and a height is no longer detected. In addition, in spite of preparing the upper limit in the count of an exposure of laser light and having irradiated laser light to the upper limit, when a height is detected again, the magnetic disk stops future laser light exposures as a poor floatation property.
[0030] Here, the clearance condition of the height formed in the magnetic-disk front face and its height is explained using drawing 3 and drawing 4 . In addition, drawing 3 shows the case where aluminum is used as a substrate of a magnetic disk, and drawing 4 shows the case where glass is used as a substrate of a magnetic disk.
[0031] In drawing 3 (A), nickel-P plating is performed to the front face of the aluminum substrate 12 which constitutes a magnetic disk 10. On the aluminum substrate 12, the magnetic-recording medium film 14 containing a magnetic film is formed. If foreign matter 16A, such as dust, adheres to the front face of the aluminum substrate 12 in the formation process of the magnetic-recording medium film 14 etc., magnetic-recording medium film 14A will be formed on foreign matter 16A, and height 18A will be formed.

[0032] When height H from the front face of the magnetic-recording medium film 14 to the front face of magnetic-recording medium film 14A in which foreign matter 16A was formed is higher than the flying height (for example, 30nm) of the head 30 for floatation property measurement shown in drawing 1 , the acoustic wave generated when the head 30 for floatation property measurement collides with height 18A is detected by the acoustic emission detector 38. An arithmetic circuit 40 detects the location (a radius r and angle of rotation theta) of height 18A, controls the point-to-point control circuit 58 and the laser oscillation control circuit 56, and irradiates a laser beam LB in the location of height 18A. Since foreign matter 16A is dust etc., it disperses easily by the power of the irradiated laser beam LB. Also when magnetic-recording medium film 14A is selectively connected with the magnetic-recording medium film 14 of the circumference of it, moreover, magnetic-recording medium film 14A By the laser beam LB, easily, although melting and drawing on the right-hand side of drawing 3 (A) where it evaporates and foreign matter 16A is removed show the condition after clearance of foreign matter 16A If height h from the front face of the magnetic-recording medium film 14 becomes lower than the flying height (for example, 30nm) of the head 30 for floatation property measurement shown in drawing 1 , in order that the head 30 for floatation property measurement may not collide with height 18A, An acoustic wave is not generated, either but existence of a height is no longer detected depending on the acoustic emission detector 38. It is detectable that height 18A was removed with this. Burr 14B of magnetic-recording medium film 14A occurs by the exposure of a laser beam LB after clearance of a height around the exposure section of a laser beam LB. A floatation property will become good if height h of burr 14B becomes lower than the flying height (for example, 30nm) of the head 30 for floatation property measurement. By one exposure of a laser beam LB, when height 18A is not removed thoroughly, the exposure of a laser beam LB is repeated.
[0033] In addition, since the aluminum substrate 12 is used, some aluminum substrates 12 may fuse by the exposure of a laser beam LB, but since the amount of melting is slight, it is uninfluential to the substrate itself.
[0034] Drawing 3 (B) shows the case where minute height 18B is formed on the aluminum substrate 12. On the aluminum substrate 12 of a magnetic disk 10, the magnetic-recording medium film 14 containing a magnetic film is formed on the aluminum substrate 12. For example, in the washing process of Saki of the formation process of the magnetic-recording medium film 14, if it progresses to the formation process of the magnetic-recording medium film 14 while the detergent adhering to the front face of the aluminum substrate 12 had remained as foreign matter 16B, magnetic-recording medium film 14B will be formed on foreign matter 16B, and height 18B will be formed.
[0035] When height H from the front face of the magnetic-recording medium film 14 to the front face of magnetic-recording medium film 14B in which foreign matter 16B was formed is higher than the flying height (for example, 30nm) of the head 30 for floatation property measurement shown in drawing 1 , the acoustic wave generated when the head 30 for floatation property measurement collides with a height 18 is detected by the acoustic emission detector 38. Here, the height of height 18B is low compared with height 18A by foreign matter 16A, such as dust, as shown in drawing 3 (A). Consequently, magnetic-recording medium film 14B in which foreign matter 16B was formed is continuously combined with the magnetic-recording medium film 14 of the circumference of it firmly. Therefore, the clearance on a polish tape etc. is difficult.
[0036] An arithmetic circuit 40 detects the location (a radius r and angle of rotation theta) of a height 18, controls the point-to-point control circuit 58 and the laser oscillation control circuit 56, and irradiates a laser beam LB in the location of height 18B. Easily, a laser beam LB fuses magnetic-recording medium film 14B, and it evaporates by it, and evaporation clearance of the foreign matter 16B under it is carried out by the exposure of a laser beam LB.
[0037] Although drawing on the right-hand side of drawing 3 (B) shows the condition after clearance of foreign matter 16A If height h from the front face of the magnetic-recording medium film 14 becomes lower than the flying height (for example, 30nm) of the head 30 for floatation property measurement shown in drawing 1 , in order that the head 30 for floatation property measurement may not collide with a height 18, An acoustic wave is not generated, either but existence of a height is no longer detected

depending on the acoustic emission detector 38. It is detectable that the height 18 was removed with this. Burr 14B of magnetic-recording medium film 14A occurs by the exposure of a laser beam LB after clearance of a height around the exposure section of a laser beam LB. A floatation property will become good if height h of burr 14B becomes lower than the flying height (for example, 30nm) of the head 30 for floatation property measurement. When magnetic-recording medium film 14B has combined with the surrounding magnetic-recording medium film 14 firmly, it becomes possible by repeating the exposure of a laser beam LB to remove a height 18 thoroughly.
[0038] Drawing 3 (C) shows the case where height 18C is formed in it by forming magnetic-recording medium film 14C in the front face of the climax section 12C since minute climax section 12C is shown in the front face of aluminum substrate 12 the very thing. Minute climax section 12C is produced at the time of texture processing of the aluminum substrate 12.
[0039] When height H to the front face of magnetic-recording medium film 14C in which minute climax section 12C was formed from the front face of the magnetic-recording medium film 14 is higher than the flying height (for example, 30nm) of the head 30 for floatation property measurement shown in drawing 1 , the acoustic wave generated when the head 30 for floatation property measurement collides with a height 18 is detected by the acoustic emission detector 38. Here, the height of height 18C is low like height 18B, as shown in drawing 3 (B). Consequently, magnetic-recording medium film 14C formed on minute climax section 12C is continuously combined with the magnetic-recording medium film 14 of the circumference of it firmly. Therefore, the clearance on a polish tape etc. is difficult. Moreover, it is difficult to also remove climax section 12C of aluminum substrate 12 the very thing.
[0040] An arithmetic circuit 40 detects the location (a radius r and angle of rotation theta) of height 18C, controls the point-to-point control circuit 58 and the laser oscillation control circuit 56, and irradiates a laser beam LB in the location of height 18C. Easily, a laser beam LB fuses magnetic-recording medium film 14C, and it evaporates by it, and melting clearance of climax section 12C of the aluminum substrate under it is carried out by the exposure of a laser beam LB.
[0041] Although drawing on the right-hand side of drawing 3 (C) shows the condition after clearance of height 18C If height h from the front face of the magnetic-recording medium film 14 becomes lower than the flying height (for example, 30nm) of the head 30 for floatation property measurement shown in drawing 1 , in order that the head 30 for floatation property measurement may not collide with height 18C, An acoustic wave is not generated, either but existence of a height is no longer detected depending on the acoustic emission detector 38. It is detectable that height 18C was removed with this. Burr 14B of magnetic-recording medium film 14A occurs by the exposure of a laser beam LB after clearance of a height around the exposure section of a laser beam LB. A floatation property will become good if height h of burr 14B becomes lower than the flying height (for example, 30nm) of the head 30 for floatation property measurement. When magnetic-recording medium film 14C has combined with the surrounding magnetic-recording medium film 14 firmly, it becomes possible by repeating the exposure of a laser beam LB to remove height 18C thoroughly. Moreover, climax section 12C of aluminum substrate 12 the very thing also becomes possible [removing] by repeating the exposure of a laser beam LB.
[0042] Next, the case where glass is used as a substrate of a magnetic disk is explained using drawing 4 . Fundamentally about clearance of a height, it is the same as that of the case of an aluminum substrate. When the minute climax section is in the glass substrate itself especially, in order that a laser beam may penetrate a glass substrate, in the point that the glass substrate itself cannot be dissolved, it is different with the laser beam.
[0043] That is, in drawing 4 (A), the magnetic-recording medium film 14 containing a magnetic film is formed on glass substrate 12X which constitutes a magnetic disk 10. In the formation process of the magnetic-recording medium film 14 etc., if foreign matter 16A, such as dust, adheres to the front face of glass substrate 12X, magnetic-recording medium film 14A will be formed on foreign matter 16A, and height 18A will be formed.
[0044] The acoustic wave generated when the head 30 for floatation property measurement collides with height 18A is detected by the acoustic emission detector 38. An arithmetic circuit 40 detects the

location (a radius r and angle of rotation theta) of height 18A, controls the point-to-point control circuit 58 and the laser oscillation control circuit 56, and irradiates a laser beam LB in the location of height 18A. Since foreign matter 16A is dust etc., it disperses easily by the power of the irradiated laser beam LB. Moreover, when magnetic-recording medium film 14A is selectively connected with the magnetic-recording medium film 14 of the circumference of it, melting and drawing on the right-hand side of drawing 4 (A) where it evaporates and foreign matter 16A is removed show the condition after clearance of foreign matter 16A easily by the laser beam LB, and magnetic-recording medium film 14A is also the same as that of drawing 3 (A). By one exposure of a laser beam LB, when height 18A is not removed thoroughly, the exposure of a laser beam LB is repeated.
[0045] Drawing 4 (B) shows the case where minute height 18B is formed on glass substrate 12X. On glass substrate 12X of a magnetic disk 10, the magnetic-recording medium film 14 containing a magnetic film is formed on glass substrate 12X. For example, in the washing process of Saki of the formation process of the magnetic-recording medium film 14, if it progresses to the formation process of the magnetic-recording medium film 14 while the detergent adhering to the front face of glass substrate 12X had remained as foreign matter 16B, magnetic-recording medium film 14B will be formed on foreign matter 16B, and height 18B will be formed. a height -- 18 -- B -- height -- dust -- etc. -- a foreign matter -- 16 -- A -- depending -- a height -- 18 -- A -- comparing -- low -- a sake -- a foreign matter -- 16 -- B -- forming -- having had -- magnetic recording -- a medium -- the film -- 14 -- B -- the -- the circumference -- magnetic recording -- a medium -- the film -- 14 -- continuous -- firm -- joining together -- having -- **** . Therefore, the clearance on a polish tape etc. is difficult.
[0046] The acoustic wave generated when the head 30 for floatation property measurement collides with height 18B is detected by the acoustic emission detector 38. An arithmetic circuit 40 detects the location (a radius r and angle of rotation theta) of height 18B, controls the point-to-point control circuit 58 and the laser oscillation control circuit 56, and irradiates a laser beam LB in the location of height 18B. Easily, a laser beam LB fuses magnetic-recording medium film 14B, and it evaporates by it, and evaporation clearance of the foreign matter 16B under it is carried out by the exposure of a laser beam LB.
[0047] Drawing on the right-hand side of drawing 4 (B) shows the condition after clearance of foreign matter 16B, and is the same as that of drawing 4 (A). By one exposure of a laser beam LB, when height 18B is not removed thoroughly, the exposure of a laser beam LB is repeated.
[0048] Drawing 4 (C) shows the case where height 18C is formed in it by forming magnetic-recording medium film 14C in the front face of the climax section 12C since minute climax section 12C is shown in the front face of the glass substrate 12X itself. Minute climax section 12C is produced at the time of texture processing of glass substrate 12X.
[0049] The acoustic wave generated when the head 30 for floatation property measurement collides with height 18C is detected by the acoustic emission detector 38. An arithmetic circuit 40 detects the location (a radius r and angle of rotation theta) of height 18B, controls the point-to-point control circuit 58 and the laser oscillation control circuit 56, and irradiates a laser beam LB in the location of height 18B. Easily, a laser beam LB fuses magnetic-recording medium film 14B, and it evaporates by it, and evaporation clearance of the foreign matter 16B under it is carried out by the exposure of a laser beam LB. However, it is difficult to remove climax section 12C of the glass substrate 12X itself.
[0050] Although drawing on the right-hand side of drawing 4 (C) shows the condition after clearance of height 18C and is the same as that of drawing 3 (A), the climax section 12Y of glass substrate 12X itself is not removed. By one exposure of a laser beam LB, when height 18C is not removed thoroughly, the exposure of a laser beam LB is repeated.
[0051] As explained above, according to this operation gestalt, the minute projection formed in a front face at the time of manufacture of a record disk is removable. Therefore, the yield at the time of manufacture of a record disk can be improved.
[0052] Next, the whole magnetic-disk manufacturing installation configuration by the 2nd operation gestalt of this invention is explained using drawing 5 . In addition, the same sign as drawing 1 shows the same part.

[0053] In this operation gestalt, although the configuration of a means to detect the height on a magnetic disk is the same as that of what was shown in drawing 1, the configuration of a means to remove a height differs from what was shown in drawing 1.
[0054] The magnetic disk 10 with which the magnetic film which is medium film, and the protective coat were formed rotates with the rotary motor 20 controlled by the motor control circuit 24. The motor control circuit 24 is equipped with the encoder, and outputs the angle-of-rotation information theta from a criteria location to an arithmetic circuit 40.
[0055] The head 30 for floatation property measurement has surfaced by the predetermined flying height on the front face of a magnetic disk 10. The positioning device 32 performs positioning of the magnetic disk 10 of the head 30 for floatation property measurement which receives radially. The point-to-point-control circuit 34 outputs the radius positional information r which shows the radial location of the head 30 for floatation property measurement to a magnetic disk 10 to an arithmetic circuit 40 while controlling the positioning device 32.
[0056] When the head 30 for floatation property measurement collides with the height of the front face of a magnetic disk 10, an acoustic wave (acoustic emission) generates the piezo-electric element 36 for acoustic emission detection with which the head 30 for floatation property measurement was equipped. By the acoustic emission detector 38, the generated acoustic emission is detected as an electrical signal, and is outputted to arithmetic circuit 40A.
[0057] Arithmetic circuit 40A detects the location of the height of the front face of a magnetic disk 10 based on the angle-of-rotation information theta inputted from the radius positional information r inputted from the point-to-point control circuit 34, and the motor control circuit 24, when the height of the front face of a magnetic disk 10 is detected by the acoustic emission detector 38.
[0058] The magnetic disk 10 with which the location of the height of the front face of a magnetic disk 10 was detected is conveyed in a vacuum housing 62 according to the conveyance device 60. In the vacuum housing 62, the spindle 72 driven with a rotary motor 70 is formed, and the conveyed magnetic disk 10 is held at a spindle 72. The rotational frequency of a rotary motor 70 is controlled by the motor control circuit 74. Moreover, the motor control circuit 74 is equipped with the encoder, and an encoder outputs the angle-of-rotation information theta from a criteria location to arithmetic circuit 40A. The rotary motor 70 is being fixed to the base 26.
[0059] Furthermore, in the vacuum housing 62, it has the corpuscular ray generator 80. In the case of an electron ray, in the case of a corpuscular ray, a gallium melting mold ion generator is used, using a tungsten filament mold with high brightness as a corpuscular ray generator 80. The corpuscular ray emitted from the corpuscular ray generator 80 is irradiated by the front face of a magnetic disk 10 using the lens system 82 for particle radiation. He is trying to converge the corpuscular ray irradiated by the front face of a magnetic disk 10 in the front face of a magnetic disk 10. The wire size of the corpuscular ray in the front face of a magnetic disk 10 may be 0.1 micrometers. The positioning device 84 controls the lens system 82 for particle radiation, and controls the radial location of the corpuscular ray beam to a magnetic disk 10.
[0060] On-off control of the corpuscular ray generator 80 is carried out by the particle-radiation control circuit 86 in the exposure of a corpuscular ray. Moreover, the point-to-point-control circuit 88 controls the radial location of the corpuscular ray irradiated by the front face of a magnetic disk 10 using the positioning device 84.
[0061] Next, clearance actuation of the height on the front face of a magnetic disk by the magnetic-disk manufacturing installation by this operation gestalt is explained. If the height of the front face of a magnetic disk 10 is detected by the acoustic emission detector 38, arithmetic circuit 40A will detect the location of the height of the front face of a magnetic disk 10 based on the angle-of-rotation information theta inputted from the radius positional information r inputted from the point-to-point control circuit 34 when the height is detected, and the motor control circuit 24.
[0062] After detection of the location of a height, a magnetic disk 10 is conveyed by the transport device 60 in a vacuum housing 62, and is fixed to a spindle 72. Next, arithmetic circuit 40A outputs the radius positional information r to the positioning circuit 88. Based on the inputted radius positional

information r, the positioning circuit 88 drives the lens system 82 for particle radiation, and it controls it so that the radial location of a corpuscular ray beam serves as a radius r to a magnetic disk 10.
[0063] Moreover, based on the angle-of-rotation information theta acquired from the motor control circuit 74, arithmetic circuit 40A is the timing used as the angle of rotation theta 1 when a height is detected, and an ON command operates delivery and the corpuscular ray generator 80 to the particle-radiation control circuit 86, and it carries out the spot exposure of the corpuscular ray beam on the front face of a magnetic disk 10.
[0064] The heights 18A, 18B, and 18C which were explained by the exposure of the corpuscular ray beam to a height in drawing 3 (A) - (C) and drawing 4 (A) - (C) are removed. Here, in this operation gestalt, by replacing with a laser beam and using a corpuscular ray, width of face becomes removable [the detailed projection of 0.1 micrometers or less], and reduction in a record section can be reduced. The pit width of face (the die length of the circumferencial direction of the pit formed in the circumferencial direction of a truck) of the width of face (the radial die length of a magnetic track) of the truck formed in the magnetic-substance film of the front face of a magnetic disk 10 is as narrow as 0.3 micrometers to being about 3 micrometers. Therefore, since what is necessary is just to remove the magnetic-substance film for one pit by min by using a corpuscular ray with a beam diameter of 0.1 micrometers, reduction in a record section can be reduced. When the laser beam whose beam diameter is 1 micrometer is used, reduction can be reduced to or less about 1 / 3 to the record section for at least 4 pits being removed.
[0065] Especially, as a corpuscular ray, since the sputtering effectiveness of an ion beam is added by using an ion corpuscular ray, a clearance rate can improve by 10 times the electron ray.
[0066] In addition, Ushiro's removed configuration was the same as that of what is shown in drawing 3 and drawing 4 almost.
[0067] As explained above, according to this operation gestalt, the minute projection formed in a front face at the time of manufacture of a record disk is removable. Therefore, the yield at the time of manufacture of a record disk can be improved.
[0068] Moreover, a clearance rate can be especially improved by removing a height using an ion corpuscular ray.
[0069] Next, the whole magnetic-disk manufacturing installation configuration by the 3rd operation gestalt of this invention is explained using drawing 6 . In addition, the same sign as drawing 1 shows the same part.
[0070] In this operation gestalt, the configuration of a means to use an optical detection means and to remove a height is the same as that of what was shown in drawing 1 as a means to detect the height on a magnetic disk.
[0071] The laser light emitted from the laser light oscillation and the detector 90 is irradiated by the front face of a magnetic disk 10 after considering as the two flux of lights using the optical system 92 for a laser beam exposure. The light reflected on the front face of a magnetic disk 10 is returned to a laser light oscillation and a detector 90 using the optical system 92 for a laser beam exposure. The laser light oscillation and the detector 90 are equipped with two photodetectors, and detects the optical reinforcement of the 2 flux of lights reflected on the front face of a magnetic disk 10, respectively. When a height is shown in the front face of a magnetic disk 10, since the irradiated light is diffracted, it can detect the existence of a height by detecting the phase contrast of the 2 flux of light.
[0072] The positioning device 94 drives the optical system 92 for a laser beam exposure, and controls the radial location of the laser beam to a magnetic disk 10. The positioning device 94 consists of a device in which an objective lens is driven with a voice coil, like the optical pickup in an optical disk unit.
[0073] On-off control of a laser light oscillation and the detector 90 is carried out by the laser oscillation control detector 96 in the oscillation of a laser beam. Moreover, the point-to-point-control circuit 98 controls the radial location of the laser light irradiated by the front face of a magnetic disk 10 using the positioning device 94.
[0074] If the height on a magnetic disk 10 is detected by the laser oscillation control detector 96, by it,

the detection information will be outputted to arithmetic circuit 40B. Arithmetic circuit 40B detects the location of the height of the front face of a magnetic disk 10 based on the angle-of-rotation information theta inputted from the radius positional information r inputted from the point-to-point control circuit 98, and the motor control circuit 24, when the height of the front face of a magnetic disk 10 is detected by the laser oscillation control detector 96.

[0075] Next, the clearance means of the height on the front face of a magnetic disk by the magnetic-disk manufacturing installation by this operation gestalt is the same as that of what was shown in drawing 1 .

[0076] If the height of the front face of a magnetic disk 10 is detected by the laser oscillation control detector 96, arithmetic circuit 40B will detect the location of the height of the front face of a magnetic disk 10 based on the angle-of-rotation information theta inputted from the radius positional information r inputted from the point-to-point control circuit 98 when the height is detected, and the motor control circuit 24. Arithmetic circuit 40B outputs the radius positional information r to the point-to-point control circuit 58. Based on the inputted radius positional information r, the point-to-point control circuit 58 drives the optical system 52 for a laser beam exposure, and it controls it so that the radial location of a laser beam serves as a radius r to a magnetic disk 10.

[0077] Moreover, the laser beam irradiated by the optical system 92 for a laser beam exposure, When 180 degrees of locations of the angle-of-rotation direction of the laser beam irradiated by the optical system 52 for a laser beam exposure have shifted, arithmetic circuit 40B Based on the angle-of-rotation information theta acquired from the motor control circuit 24, to the angle of rotation theta 1 when a height is detected to the timing from which angle of rotation became theta1+180 degree An ON command operates delivery and the laser oscillator 50 to the laser oscillation control circuit 56, and the spot exposure of the laser beam is carried out on the front face of a magnetic disk 10. The height of the front face of a magnetic disk 10 is removed by the spot exposure of laser light.

[0078] Moreover, a height has not only when foreign matters, such as dust, adhere on the surface of a magnetic disk, but the minute projection produced by adhesion of a detergent etc. and the minute projection by climax of a magnetic-disk substrate. Since, as for these projections, the ease of carrying out of clearance differs, the exposure of laser light is divided into multiple times, and it is made to perform it.

[0079] As explained above, according to this operation gestalt, the minute projection formed in a front face at the time of manufacture of a record disk is removable. Therefore, the yield at the time of manufacture of a record disk can be improved.

[0080] Moreover, for a non-contact type ****** reason, consumption of a detecting element can be prevented for detection and clearance of a height using a laser beam.

[0081] Next, the whole magnetic-disk manufacturing installation configuration by the 4th operation gestalt of this invention is explained using drawing 7 . In addition, the same sign as drawing 1 , drawing 5 , and drawing 6 shows the same part.

[0082] In this operation gestalt, the corpuscular ray explained in drawing 5 as a means to use the optical detection means explained in drawing 6 as a means to detect the height on a magnetic disk, and to remove a height is used. Therefore, the configuration and actuation of the detecting element of a height are as having explained in drawing 6 , and the configuration and actuation of the clearance section of a height are as having explained in drawing 5 . In addition, unlike the configuration in drawing 5 , a transport device does not have but the detecting element of a height and the clearance section are arranged in the vacuum housing 62.

[0083] If the height on a magnetic disk 10 is detected by the laser oscillation control detector 96, by it, the detection information will be outputted to arithmetic circuit 40C. Arithmetic circuit 40C detects the location of the height of the front face of a magnetic disk 10 based on the angle-of-rotation information theta inputted from the radius positional information r inputted from the point-to-point control circuit 98, and the motor control circuit 24, when the height of the front face of a magnetic disk 10 is detected by the laser oscillation control detector 96.

[0084] Arithmetic circuit 40C outputs the radius positional information r to the point-to-point control

circuit 88. Based on the inputted radius positional information r, the point-to-point control circuit 88 drives the optical system 82 for particle radiation, and it controls it so that the radial location of a corpuscular ray beam serves as a radius r to a magnetic disk 10.
[0085] Moreover, based on the angle-of-rotation information theta acquired from the motor control circuit 24, as for arithmetic circuit 40C, an ON command operates delivery and the particle-radiation machine 80 to the particle-radiation control circuit 86, and it carries out the spot exposure of the corpuscular ray on the front face of a magnetic disk 10. The height of the front face of a magnetic disk 10 is removed by the exposure of a corpuscular ray.
[0086] As explained above, according to this operation gestalt, the minute projection formed in a front face at the time of manufacture of a record disk is removable. Therefore, the yield at the time of manufacture of a record disk can be improved.
[0087] Moreover, since a magnetic disk is not conveyed while it had been fixed to the spindle by it, its positioning accuracy of particle radiation improves.
[0088]
[Effect of the Invention] According to this invention, the minute projection formed in a front face at the time of manufacture of a record disk is removable.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the magnetic-disk manufacturing installation for removing the projection on the front face of a disk by 1 operation gestalt of this invention.
[Drawing 2] It is the explanatory view of the positional information of the height detected from the magnetic disk in the magnetic-disk manufacturing installation by 1 operation gestalt of this invention.
[Drawing 3] It is the explanatory view of the clearance condition of the height on the front face of a magnetic disk by the magnetic-disk manufacturing installation by this operation gestalt.
[Drawing 4] It is the explanatory view of the clearance condition of the height on the front face of a magnetic disk by the magnetic-disk manufacturing installation by this operation gestalt.
[Drawing 5] It is the block diagram of the magnetic-disk manufacturing installation for removing the projection on the front face of a disk by the 2nd operation gestalt of this invention.
[Drawing 6] It is the block diagram of the magnetic-disk manufacturing installation for removing the projection on the front face of a disk by the 3rd operation gestalt of this invention.
[Drawing 7] It is the block diagram of the magnetic-disk manufacturing installation for removing the projection on the front face of a disk by the 4th operation gestalt of this invention.
[Description of Notations]
10 -- Magnetic disk
16 -- Foreign matter
18 -- Height
24 -- Revolution motor control circuit
30 -- Head for floatation property measurement
32, 54, 84, 94 -- Positioning device
34, 58, 88, 98 -- Point-to-point control circuit
36 -- Piezo-electric element
38 -- Acoustic emission detector
40 -- Arithmetic circuit
50 -- Laser light oscillator
52 -- Optical system for a laser light exposure
56 96 -- Laser light oscillation control circuit
60 -- Conveyance device
62 -- Vacuum housing
80 -- Corpuscular ray generator
82 -- Lens system for particle radiation
86 -- Control circuit of the particle-radiation section
90 -- Laser light oscillation detector
92 -- Laser light phase contrast detection optical system

[Translation done.]